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VIRTUAL EXCHANGE AS AN INSTRUCTIONAL DESIGN APPROACH TO PROMOTING CRITICAL SKILLS IN HIGHER EDUCATION: A CASE STUDY OF PROJECT-BASED COLLABORATION ON “SOCIAL ROBOTS IN EDUCATION”

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Abstract

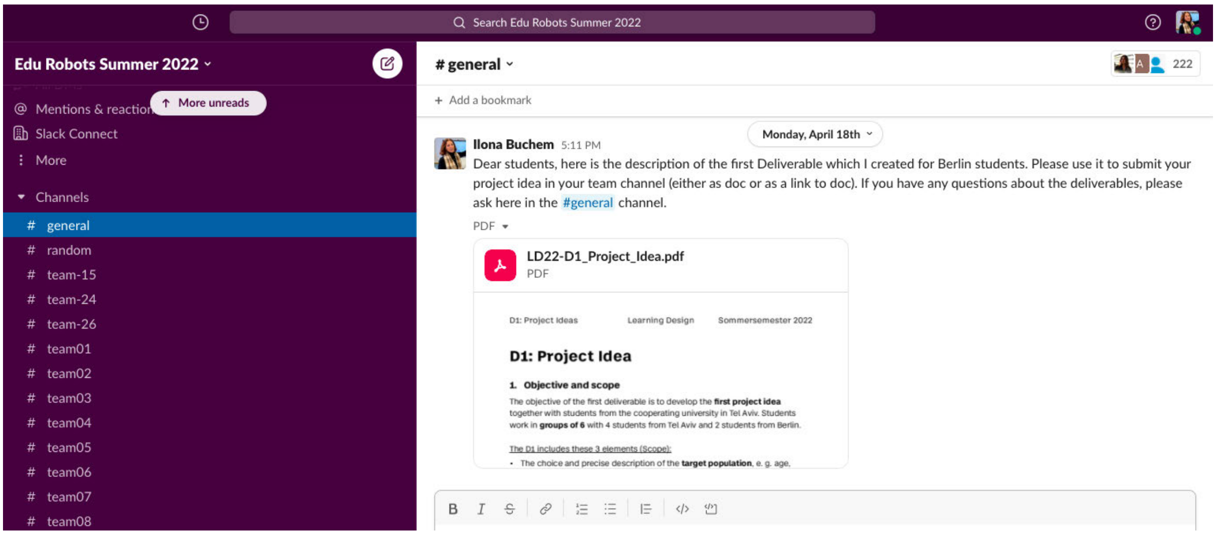
Virtual exchanges have become a valuable way of internationalising higher education in face of an increasing global mobility. Virtual exchanges encompass a wide range of education programmes and activities supported by digital technologies, in which learners with different cultural backgrounds and at different geographical locations interact and learn with the guidance of teachers or facilitators. This paper describes the first exploratory results related to the acquisition of critical skills by students who participated in an international virtual exchange on the topic of “Social Robots in Education”. The virtual exchange described in this paper took place with students and teachers from two universities in Germany and Israel during the summer semester from April to June 2022. This paper discusses the contribution of the virtual exchange to the development of students’ critical skills in the context of higher education and reports on the results from the online-survey with 101 students from Germany and Israel who participated in the virtual exchange. The results indicate that students perceive virtual exchanges as a valuable learning experience, in which they develop a wide range of skills that have been frequently considered as future skills or 21st century skills and encompass skills and attitudes such as higher order thinking skills, cognitive and metacognitive skills, digital skills and digital citizenship, communication and collaboration skills, openness towards people from other cultures, as well as creativity and innovation. The paper ends with suggestions for integrating virtual exchanges into university courses to promote such critical skills and for possible areas in further research.

Keywords: Virtual exchange, international collaboration, future skills, digital skills, higher education.

1 INTRODUCTION

Virtual exchanges have become a valuable way of internationalising higher education in face of an increasing global mobility. Virtual exchanges encompass a wide range of education programmes and activities supported by digital technologies, in which learners with different cultural backgrounds and at different geographical locations interact and learn with the guidance of teachers or facilitators [1]. A recent study has shown that the awareness about virtual exchanges in higher education has increased among educators during the time of the pandemic [1]. A number of studies have shown that virtual exchanges are beneficial for the development of intercultural skills [2], digital literacy [3], foreign language competence [4] and intercultural communicative competence [5]. Newer approaches to virtual mobility, such as open virtual mobility based on the principles of open education, identified competencies and skills supported by open virtual mobility, which include intercultural skills and attitudes; networked learning; active self-regulated learner skills; media and digital literacy; autonomy-driven learning, interactive and collaborative learning in an authentic international environment and open-mindedness [6]. These results seem to converge with the results of the studies on 21st century skills and future skills. The literature review conducted by [7] in relation to definitions of 21st century skills in five theoretical frameworks, i. e. Partnership for 21st century skills (P21), En Gauge, Assessment and Teaching of 21st Century Skills (ATCS), National Educational Technology Standards (NETS/ISTE), and the National Assessment of Educational Progress (NAEP) showed that the analysed frameworks converge on a common set of 21st century skills which include collaboration, communication, ICT literacy, and social and/or cultural competencies including citizenship. The OECD Learning Compass 2030 [8] related to identifying key skills for 2030 distinguished between three types of skills, i. e. cognitive and meta-cognitive skills, which include critical thinking, creative thinking, learning-to-learn and self-regulation social and emotional skills, which include empathy, self-efficacy, responsibility and collaboration, practical and physical skills, which include using new information and communication technology devices. The report by OECD defined skills as “a holistic concept of competency, involving the mobilisation of knowledge, skills, attitudes and values to meet complex demands” [8, p. 86].

The virtual exchange described in this paper was designed to enhance related learning outcomes including competencies, skills and attitudes of students in view of global changes and with the aim to support students in adapting to job-related and societal challenges and at the same time actively shaping new global communication and collaboration patterns. The virtual exchange was dedicated to the topic of “Social Robots in Education” and took place during the summer term 2022, from April to June 2022 with students and teachers from two universities, one in Germany and one in Israel. The aim of the virtual exchange was to bring students together to collaborate in international teams on innovative solutions on the application of social robots in education, learn from each other, value different approaches and perspectives, and give each other constructive peer-feedback for learning. The virtual exchange followed a project-based approach in which teams of students worked on projects related to creating learning experience designs with the support of social robots. The courses involved in the virtual exchange were the “Learning Design” course in the B. Sc. "Digital Business" in Germany with approx. 60 students and the “Human Computer Interaction” course in the B. Sc. program "Information Systems" in Israel with approx. 180 students. The virtual exchange was facilitated by the teachers in both courses. The virtual exchange included two synchronous meetings for all students and teachers: one at the beginning and one at the end of the virtual exchange. The synchronous exchanges were organised in the web conferencing platform Zoom and combined online presentations, discussion sessions and peer-feedbacks in international student groups in breakout rooms. Additionally international student teams met and worked together using different digital channels such as WhatsApp and Google Drive. The asynchronous virtual exchanges take place in the workplace communication tool Slack (Fig. 1). The structure of the virtual exchange was based on four milestones, each marked by the submission of one of the four deliverables. Deliverable 1 was designed as a collaborative task in which students from Germany and Israel collaborated on the description of the first idea for the project on “Social Robots in Education” and jointly agreed on the topic, design question and the description of the target group, following the process in the Learning Experience Design. Deliverable 2 focused on ethnographic research conducted by students in Israel which aimed at understanding and describing the needs of the target group in relation to the project idea. Students from Germany provided feedback on the results of the ethnographic research. Deliverable 3 focused on the in-depth description of the persona and the learning design, using Empathy Maps and Learning Experience Canvas as templates in the online collaborative whiteboard platform Miro. Students from Israel provided feedback on the results generated by German students. Finally, Deliverable 4 was designed as a joint activity, in which students from Germany and Israel collaborated on the creation of a use case diagram to illustrate an interaction between a social robot and a human learner in context of the specific project idea followed by each group.



Ilona Buchem 5:11 PM
Dear students, here is the description of the first Deliverable which I created for Berlin students. Please use it to submit your project idea in your team channel (either as doc or as a link to doc). If you have any questions about the deliverables, please ask here in the #general channel.

LD22-D1_Project_Idea.pdf
PDF

D1: Project Ideas Learning Design Sommersemester 2022

D1: Project Idea

1. Objective and scope

The objective of the first deliverable is to develop the **first project idea** together with students from the cooperating university in Tel Aviv. Students work in **groups of 6** with 4 students from Tel Aviv and 2 students from Berlin.

The D1 includes these 3 elements (Scope):

- The choice and precise description of the **target population**, e. g. age,

Figure 1. Screenshot from the Slack workspace “Edu Robots Summer 2022”.

The remainder of this paper is structured as follows. In the next section we present the methodology for conducting an exploratory study about the skills which students developed during the virtual exchange. Next, we present the results of the study and discuss the results from the perspective of the facilitators of the virtual exchange. We finish with conclusions on the contribution of virtual exchanges to promoting a set of skills which have been often framed as “future skills” of “21st century skills” in the context of higher education.

2 METHODOLOGY

The exploratory case study was conducted during the first part of the virtual exchange and is based on the analysis of the quantitative data from an online survey designed to capture student perceptions of 21st century skills. The online survey was designed using Google Form as a survey tool. Altogether 101 students participated in the study, 23 from Germany and 85 from Israel. Table 1 provides an overview of the study sample.

Table 1. Study sample.

	Germany	**Israel**	**Total**
Sample size	23 (21,3%)	85 (78,7%)	101
Gender	female 10 (43.5%) male 13 (56.5%) other 0	female 48 (56.5%) male 36 (42.4%) other 1 (0.9%)	female 58 (53.7%) male 49 (45.4%) other 1 (0.9%)
Age			
18-20	3 (13%)	2 (2.4%)	5 (4.6%)
21-23	9 (39%)	20 (23.5%)	29 (26.9%)
24-26	4 (17%)	53 (62.4%)	57 (52.8%)
27-29	4 (17%)	10 (11.8%)	14 (13%)
30-32	2 (9%)	0	2 (1.9%)
over 33	1 (4%)	0	1 (0.9%)

3 RESULTS

This section summarises results from the exploratory study. The analysis of the quantitative data is based on students’ answers in the online survey designed to capture student perceptions of the skills and attitudes they developed through participation in the virtual exchange. The list of skills and attitudes included the following 11 items:

1 Social and emotional skills, such as empathy and respect for others as defined by [8],

2 Ability to communicate in an ethnically, culturally and linguistically diverse context as defined by [8],

3 Cognitive and meta-cognitive skills, such as critical thinking, creative thinking and learning-to-learn as defined by [8],

4 Practical digital skills, such as using new information and communication technologies as defined by [8],

5 Higher-order skills, such as problem solving, decision making and ethical judgement as defined by [8],

6 Research and information fluency such as applying digital tools to gather, evaluate and use information as defined by [9],

7 Communication and collaboration, such as using digital media to communicate and work collaboratively as defined by [9],

8 Digital citizenship, such as understanding human, cultural and societal issues related to technology as defined by [9],

9 Life and career skills, such as flexibility, adaptability, productivity, leadership and responsibility as defined by [10],

10 Openness towards people from other cultures, respect for cultural otherness, global-mindedness as defined by [8],

11 Creativity and innovation such as developing new products and processes using technology as defined by [9].

Students from Germany and Israel were asked to self-assess which of these skills and attitudes they have been developing in the course of the virtual exchange by rating each item in the scale from "1 = I have not been learning this at all" to "5 = I have been learning this very intensely". Table 2 summarises the results from the online survey.

Table 2. Survey results related to the self-assessment of skills developed during the virtual exchange. Rating scale: "1 = I have not been learning this at all" to "5 = I have been learning this very intensely"

	Germany Mean, St.Dev	***Israel Mean, St.Dev***	***Total Mean, St.Dev***
Social and emotional skills, such as empathy and respect for others	**3.61**, .941	3.31, 1.175	3.37, .109
Ability to communicate in an ethnically, culturally and linguistically diverse context	**3.70**, 1.1295	**3.55**, 1.052	**3.58**, .106
Cognitive and meta-cognitive skills, such as critical thinking, creative thinking and learning-to-learn	3.04, .878	3.28, 1.151	3.23, .106
Practical digital skills, such as using new information and communication technologies	3.39, .783	3.12, 1.169	3.18, .106
Higher-order skills, such as problem solving, decision making and ethical judgement	3.22, .998	3.29, 1.132	3.28, .106
Research and information fluency such as applying digital tools to gather, evaluate and use information	3.00, .1044	3.15, 1.064	3.12, .102
Communication and collaboration, such as using digital media to communicate and work collaboratively	**3.61**, 1.033	**3.54**, 1.086	**3.56**, .103
Digital citizenship, such as understanding human, cultural and societal issues related to technology	3.48, 1.163	3.25, 1.164	3.30, .112
Life and career skills, such as flexibility, adaptability, productivity, leadership and responsibility	**3.57**, .1.121	3.20, 1.044	3.28, .103
Openness towards people from other cultures, respect for cultural otherness, global-mindedness	**4.00**, .798	**3.62**, 1.091	**3.70**, .100
Creativity and innovation such as developing new products and processes using technology	3.48, 1.123	3.34, 1.108	3.37, .107
Item statistics (all 11 items)	M = 3.462 Range 1.000	M = 3.333 Range .506	M = 3.360 Range 5.83

The results summarised in the table above show that rating across all 11 skill-related items reached the values higher than 3 indicating that students have to a sufficient extent developed skills in all the areas listed in the survey. The highest ratings, from both students in Germany and Israel, were reached for the development of skills in the areas “Openness towards people from other cultures, respect for cultural otherness, global-mindedness”, “Ability to communicate in an ethnically, culturally and linguistically diverse context” and “Communication and collaboration, such as using digital media to communicate and work collaboratively”. The lowest ratings, still above the value of 3 however, from both students in Germany and Israel, were reached for the development of skills in the areas “Research and information fluency such as applying digital tools to gather, evaluate and use information”, “Practical digital skills, such as using new information and communication technologies” and “Higher-order skills, such as problem solving, decision making and ethical judgement”. Students from Germany rated several skills such as “Social and emotional skills, such as empathy and respect for others”, “Life and career skills, such as flexibility, adaptability, productivity, leadership and responsibility”, “Communication and collaboration, such as using digital media to communicate and work collaboratively” and “Openness towards people from other cultures, respect for cultural otherness, global-mindedness”, higher than students from Israel. The items statistics across all 11 items showed slightly higher mean values for ratings from German students (see last row in Tab. 2).

Additionally, the survey asked students the following question: “How do you evaluate the cooperation in your team with international students so far? Please rate from 1 = the cooperations has been very poor/unsuccessful, to 5 = the cooperations has been very good/successful.” The mean value for students from Israel (n = 85) was M = 3.75 (SD = 1.057), for students from Germany (n = 23) M = 3.74

(SD = .864) and for all students (n = 101) M = 3.75 (SD = 1.015), which indicate that students both from Germany and Israel have experienced the cooperation in international teams as successful.

Finally, the survey asked an open question about what else did students learn through the collaboration in international groups. Some of the answers includes: different culture and approaches to tasks; new insights through local empirical analysis; developing communication skills; self-management and leadership skills; self-esteem and responsibility; collaboration, human-computer interfaces and English language skills; how to listen and work with 8 different opinions; presenting your ideas in a different language; how to collaborate from a long distance; how to cooperate while dividing the task between many team members; openness to people from other cultures and learning to work together in a collaborative way. Some answers were however less positive and included: It is sometimes difficult to understand the other cultures correctly; some issues with communication (due dates, holidays etc,); there isn't much I have learned: I think it would be better to do assignments in smaller groups, we had little collaboration in our big group.

Finally, some students observed that it was good to get to know students from another country and learn that they struggle with similar issues in their studies or in their life. A student from Israel expressed it this way: “That students from Germany are very friendly and nice and working with cultural differences is fun. It was just very nice to get to know new people from other regions of the world and work with them.” While another student from Germany wrote: “This always makes me a bit more emphatic and gives me a new perspective of life. I am impressed by their very good English skills and fast thinking. Thank you for organising this cooperation!!”

4 CONCLUSIONS

This paper presented the first results from the online survey with 101 students from Germany and Israel who participated in the international virtual exchange in summer 2022. dedicated to the topic of “Social Robots in Education”. The results from the online-survey indicate that students perceived the virtual exchange as a valuable learning experience, in which they develop a wide range of skills. Most of these skills have been framed as “future skills” and “21st century skills” in recent publications. The results show that students from both Germany and Israel positively rated all skills listed in the survey, such as higher order thinking skills, cognitive and metacognitive skills, digital skills and digital citizenship, communication and collaboration skills, openness towards people from other cultures, as well as creativity and innovation. Further results from the survey indicate that the virtual exchange was perceived by most students as an opportunity to learn about different cultures and diverse approaches to tasks, developing communication, collaboration, self-management and leadership skills, enhancing self-esteem and responsibility, improving English language skills, learning how to listen and work with diverse opinions, learning how to present own ideas in a different language. However, the results have also pointed out some challenges in working together in international teams at a distance, such as difficulties in understanding the other cultures correctly, difficulties in communication and collaboration, as well as in general the challenge of collaboration in larger groups.

The key conclusion based on the results from the survey and on the insights of both authors who served as facilitators in the virtual exchange, is that international virtual exchanges may be used as an effective method for enhancing critical skills of higher education students such as the 11 skill areas listed in this paper. The key suggestion for integrating virtual exchanges into university courses to promote such critical skills is to form international groups which work together on joint outcomes and in which students have an opportunity to experience collaboration at distance and in international teams. Possible areas for further research on the topic include broader self-assessment of skills by students from different countries participating in diverse forms of virtual exchanges. A future study could compare which skills are enhanced by which types/designs of virtual exchanges, in this way providing educators and students with empirical data on which future virtual exchanges can be built.

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